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$$m_1r^{-m-1}\{-nd+[r-\tfrac{3}{2}(m+1)r^{-1}d^2](\cos\alpha+\cos2a+\cos3\alpha+\,.....\cos n\alpha)$$
$$+(m+1)d(\cos^2\alpha+\cos^2 2\alpha+\cos^2 3\alpha+......\cos n\alpha)$$
$$+\tfrac{1}{2}[(m+1)(m+3)]r^{-1}d^2(\cos^3\alpha+\cos^3 2\alpha+\cos^3 3\alpha+......\cos^3 n\alpha)\}.$$

By trigonometry,

$$\cos\alpha+\cos2\alpha+.\;\;...\cos n\alpha=\frac{\cos\frac{1}{2}(n+1)\alpha.\sin\frac{1}{2}n\alpha}{\sin\frac{1}{2}\alpha};$$

$$\cos^2\alpha+\cos^2 2\alpha+.....\;\cos^2 n\alpha=\tfrac{1}{2}\{\,n+\frac{\cos(n+1)\alpha.\sin n\alpha}{\sin\alpha}\};$$

$$\cos^3\alpha+\cos^3 2\alpha+......\cos^3 n\alpha=\frac{\cos\frac{1}{2}(n+3)\alpha.\sin\frac{3}{2}n\alpha}{4\sin\frac{3}{2}\alpha}+\frac{3\cos\frac{1}{2}(n+1)\alpha.\sin\frac{1}{2}n\alpha}{4\sin\frac{1}{2}\alpha}.$$

The value of these series when $n\alpha=2\pi$ are 0, $n/2$, and 0, respectively.

Hence the expression for the approximate value of the resultant force reduces to

$$m_1r^{-m-1}[-nd+(\tfrac{1}{2}n)(m+1)d],\ \text{or}\ \frac{m_1n(m-1)}{2r^{m+1}}d.$$

Also solved by *G. B. M. ZERR.*

PROBLEMS FOR SOLUTION.

ARITHMETIC.

95. Proposed by WALTER HUGH DRANE, A. M., Professor of Mathematics, Jefferson Military College, Washington, Miss.

Solve by arithmetic, if possible.

A man sold a house for \$7500 and gained a certain per cent. on the cost. If the cost had been 16⅔% less, his gain would have been 25% greater. Find the cost of the house.

96. Proposed by RAYMOND SMITH, Tiffin, Ohio.

How many acres in a square field whose diagonal is 10 rods longer than the side ?

⁂ Solutions of these problems should be sent to B. F. Finkel, not later than April 10.

ALGEBRA.

85. Proposed by J. M. COLAW, A. M., Monterey, Va.

Sum the infinite series

$$\frac{1}{1^2.2^2.3^2.4^2.5^2}+\frac{1}{2^2.3^2.4^2.5^2.6^2}+\frac{1}{3^2.4^2.5^2.6^2.7^2}+,\ \text{etc.}$$

86. Proposed by J. MARCUS BOORMAN, Consultative Mechanician, Counselor at Law, Inventor, Etc., Woodmere, Long Island, N. Y.

Solve $x^2+yz=16$ .....(A); $y^2+xz=17$......(B); $z^2+xy=22$......(C), for all the roots.

[This is Col. Titus' problem—see "Maseres' Tracts," pages 188-276—and is solved by Dr. Wallis in 51 pages, and by Mr. Frend in 38 pages, 8vo., but by the writer in 1 or 2 pages, 4to., or less. J. M. B.]